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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/532,155	04/20/2005	Yves Vanderperren	S1022.81236US00	1521

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BOSTON, MA 02210-2206

EXAMINER

EJAZ, NAHEED

ART UNIT	PAPER NUMBER
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2611

MAIL DATE	DELIVERY MODE
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10/17/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/532,155

Applicant(s)

VANDERPERREN ET AL.

Examiner

Naheed Ejaz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 July 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 27-52 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 27, 29-43 and 47-52 is/are rejected.
- 7) ☒ Claim(s) 28 and 44-46 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04/20/2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 27-50 have been considered but are moot in view of the new ground(s) of rejection.
2. With respect to claim 27, Applicant argues, "Dölle does not describe a frequency offset estimation unit for receiving the signal and obtaining initial information relating to a carrier frequency offset" (Remarks, dated: 07/20/07, page # 10, paragraph # 1, lines 5-7). This is not persuasive since the above-mentioned limitations of the claim are rejected by Kim (WO 00/77961) reference (see Office Action, dated: 03/13/07, page # 8, paragraph # 27).

Response to Amendment

Drawings

3. The drawings are objected to because of the following:
 - Label blocks 3-14 of figure 1.
 - Label blocks 21,22 & 24 of figure 4.
 - Label blocks 17, 26-29 of figure 8.
 - Label blocks 30-32, 34-37 & 40-43 of figures 9a, 9b & 9c.
 - Label blocks 41-56 of figure 15.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure

number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 27, 30, 31, 32, 34, 39, 40, 42, 47, 49, 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (WO 00/77961) in view of Dölle et al. (6,674,817) (hereinafter, Dolle) and further in view of Serfaty (5,293,401).

6. As per claim 27, Kim discloses, 'a frequency offset estimation unit for receiving the signal and obtaining initial information relating a carrier frequency offset' (figure 2, element 22, page # 7, lines 10-27), 'a frequency offset compensation unit for compensating the received signal with the frequency offset obtained from the frequency

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offset estimation unit to form a compensated received signal (figure 2, element 23, page # 7, lines 28-30), and a time reference determining unit for obtaining a timing reference for the received signal by cross-correlation of the compensated received signal with a known training sequence' (figures 1B & 2, elements 24 & 25, page # 8, lines 5-17).

Although, Kim performs autocorrelation on received data before estimating the frequency offset signal (figures 2, element 21, page # 5, lines 21-24, page # 10, lines 6-19) (figure 3) but he does not disclose autocorrelation signal obtained by the first and second training sequences explicitly.

Dolle discloses an autocorrelation signal obtained by autocorrelation of the first training sequence (figure 3, col.6, lines 36-60) and for obtaining an estimate of a carrier frequency offset from the initial information and an autocorrelation signal obtained by autocorrelation of the second training sequence of the received signal' (figure 8, element 19, col.7, lines 13-17, col.9, lines 48-54) (it should be noted that Dolle is distinguishing first type of data burst (claimed 'initial information') based on its autocorrelation result of first training sequence which reads on claim limitations).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Dolle into Kim in order to clearly distinguish between the different type of data burst types by giving different phase values for the first and second training sequences by performing auto-correlation (col.7, lines 12-17) as taught by Dolle thus enable a communication device to distinguish if a received data burst is of interest or not (col.3, lines 33-37).

Kim and Dolle do not teach a frame with two training sequences.

Serfaty teaches a frame having first training sequence and second training sequence (figure 2) or (figure 7, elements TR1 & TR2) (col.1,, lines 52-68, col.2, lines 1-2, col.3, lines 45-49).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to replace the frames of Kim and Dolle by Serfaty frames which have first and second training sequences in order to separate data and decode the received signal as they are transmitted as taught by Serfaty (co.2, lines 18-38, col.3, lines 45-49) thus enhance system synchronization.

7. As per claims 30 & 31, Kim discloses, 'detect a characteristic curve indicative of the known training sequence in a phase of the autocorrelation signal' & 'detect a characteristic curve indicative of the known training sequence in an amplitude of the autocorrelation signal' (see figures 1B & 4A-4C, paragraph 'Background Art') (it is noted that in figure 1B, Kim shows a curve of autocorrelation values which has synchronization symbols included (claimed 'training sequence'). Furthermore, autocorrelation value has some phase and amplitude values associated with, which would be indicated with the autocorrelation values on the curve and therefore would be equivalent to the claim limitations of having a curve which indicates a known training sequence in the phase and amplitude of the autocorrelation values).

8. As per claims 32 & 34, Kim discloses, 'the characteristic curve includes peaks and/or troughs and threshold values are used to detect the peaks and troughs' (see figures 3 & 4A-4C, page # 6, lines 26-31, page # 7, lines 1-9).

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9. Claim 39 is rejected under the same rationale as mentioned in the rejection of claim 31 above.

10. Claim 40 is rejected under the same rationale as mentioned in the rejection of claim 30 above.

11. Claim 42 is rejected under the same rationale as mentioned in the rejection of claim 32 above.

12. As per claim 47, Kim discloses, 'the timing reference determining unit is adapted to determine a symbol timing from a correlation peak in the cross-correlation of the received signal with the training sequence' (figure 2, elements 24 & 25, page # 3, lines 17-22).

13. As per claim 49, Kim teaches an apparatus and method for synchronizing symbol timing and frequency in an OFDM system (claimed 'OFDM telecommunications system') (page # 1, 'Technical Field', lines 1-4) for the receiving side as well since Kim is teaching that the synchronization apparatus and method is suitable for the broadband wireless LAN (page # 1, 'Technical Field', lines 4-9) which includes receiver as well.

14. Claim 50 is rejected under the same rationale as mentioned in the rejection of claim 27 above.

15. Claims 29, 33, 35-38, 43, 48, 51 & 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (WO 00/77961) in views of Dölle et al. (6,674,817) (hereinafter, Dolle) and Serfaty (5,293,401), as applied to claims 27, 30-32, 34, 39, 40,

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42, 47, 49, 50 above, and further in view of Almenar et al. (hereinafter, Almenar) (IEEE, "Synchronization techniques for HIPERLAN/2", Volume 2, pg # 762-766).

16. As per claim 29, Kim, Dolle and Serfaty teach all the limitations in the previous claims on which claim 29 depends but they fail to disclose detection of phase shift.

Almenar discloses, 'determining a phase shift in the autocorrelation signal of the received signal' (page # 763, col.1, paragraph # 5, page # 764, col.1).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Almenar into Kim, Dolle and Serfaty in order to achieve synchronization by adding cyclic prefix to the modulation scheme (OFDM) to make the system robust to multipath as taught by Almenar (see page # 762, col.2, paragraph # 2) thus enhance system performance.

17. As per claims 33 & 35, Kim, Dolle and Serfaty teach all the limitations in the previous claims on which claim 33 & 35 depend but they fail to disclose setting of threshold values dynamically.

Almenar teaches, 'the threshold values are set dynamically' (see page # 764, col.1) (it is noted in the mentioned column that Almenar is setting threshold values at the same he is performing the detection algorithms which reads on claim limitations of setting the threshold values dynamically).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Almenar into Kim, Dolle and Serfaty in order to compensate for carrier frequency offset by achieving the phase synchronization in

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order to avoid loss of orthogonality between the subsymbols as taught by Almenar (see page # 762, col.1, paragraph # 3) thus enhance system performance.

18. As per claim 36, Kim, Dolle and Serfaty teach all the limitations in the previous claims on which claim 36 depends but they fail to disclose carrier frequency offset from the phase shift.

Almenar teaches, 'determining the carrier frequency offset from the phase shift' (page # 762, col.2, paragraph # A, lines 13-16, page # 763, col.1, paragraphs # 1 & 2).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Almenar into Kim, Dolle and Serfaty in order to compensate for carrier frequency offset by achieving the phase synchronization in order to avoid loss of orthogonality between the subsymbols as taught by Almenar (see page # 762, col.1, paragraph # 3) thus enhance system performance.

19. As per claim 37, Kim, Dolle and Serfaty teach all the limitations in the previous claims on which claim 37 depends but they fail to disclose determining of a sign of the carrier frequency offset from a phase of the autocorrelation signal.

Almenar teaches, 'determine a sign of the CFO from the phase of the autocorrelation signal from a known sequence' (page # 764, col.1, paragraph # 4).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Almenar into Kim, Dolle and Serfaty in order to compensate for carrier frequency offset by achieving the phase synchronization in order to avoid loss of orthogonality between the subsymbols as taught by Almenar (see page # 762, col.1, paragraph # 3) thus enhance system performance.

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20. Claim 38 is rejected under the same rationale as mentioned in the rejection of claim 29 above because Almenar is determining a phase shift in the auto correlation signal which has training sequence included (page # 763, col.1, paragraph # 1, lines 10-14 & paragraph # 5).

21. Claim 43 is rejected under the same rationale as mentioned in the rejection of claim 33 above.

22. As per claim 48, Kim, Dolle and Serfaty teach all the limitations in the previous claims on which claim 48 depends but they fail to disclose autocorrelation of cyclic prefix with received signal explicitly.

Almenar discloses synchronization of OFDM signal by teaching autocorrelation of the received signal which also includes parameters based on cyclic prefix (page # 763, col.1, paragraph # 1, lines 10-14 & col.1, paragraph # 5).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Almenar into Kim, Dolle and Serfaty in order to compensate for carrier frequency offset by achieving the phase synchronization in order to avoid loss of orthogonality between the subsymbols as taught by Almenar (see page # 762, col.1, paragraph # 3) thus enhance system performance.

23. Claims 51 and 52 are rejected under the same rationale as mentioned in the rejection of claim 37 above.

24. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (WO 00/77961) in views of Dölle et al. (6,674,817) (hereinafter, Dolle) and Serfaty

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(5,293,401), as applied to claim 27 above, and further in view of Mizoguchi et al.

(6,658,063) (hereinafter, Mizoguchi).

25. As per claim 41, Kim, Dolle and Serfaty teach all the limitations in the previous claims on which claim 41 depends but they fail to disclose curve indicative of a known training sequence in the amplitude of the cross-correlation of the compensated received sequence.

Mizoguchi teaches, 'determine a characteristic curve indicative of a known training sequence in an amplitude of the cross-correlation of the compensated received sequence with the known training sequence' (see figure 4, col.1, lines 39-46, col.6, lines 25-34, col.8, lines 12-40).

It would have been obvious to one of ordinary skill in the art, at the time invention was made, to implement the teachings of Mizoguchi into Kim, Dolle and Serfaty in order to detect reference received timing accurately as taught by Mizoguchi (col.1, lines 6-12, col.5, lines 18-34) by generating compensation value of phase and amplitude caused by frequency offset.

Allowable Subject Matter

26. Claims 28, 44-46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

27. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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- Ventura (2003/0181183) teaches data aided frequency synchronization in cellular mobile equipments.
- Trott et al. (2003/0156594) teach slot structure for radio communications system (see figure 2).

Contact Information

28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Naheed Ejaz whose telephone number is 571-272-5947. The examiner can normally be reached on Monday - Friday 8:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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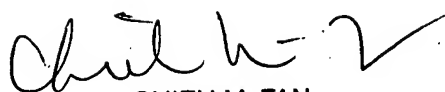
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Naheed Ejaz

Examiner

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A handwritten signature in black ink, appearing to read "Chieh M. Fan", with a stylized flourish at the end.

CHIEH M. FAN
SUPERVISORY PATENT EXAMINER